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Medicinal Plants Used by Traditional Healers in the Treatment of Gastrointestinal Disorders in Oued Souf Region (southeast of Algeria)

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ABSTRACT

This study aims to analyze indigenous knowledge of medicinal plants used by traditional healers to treat gastrointestinal disorders in the Oued Souf region. Data were collected through open-ended, semi-structured interviews. Various statistical indices, such as UV and ICF, were employed to evaluate quantitative data. The findings reveal that traditional healers utilize 47 medicinal plant species from 22 families for treating gastrointestinal disorders. Lamiaceae and Asteraceae emerge as the most dominant families, with 9 and 7 species, respectively. The most frequently used plant parts were leaves (35%), and the predominant method of preparation was infusion (55%). Among the most popular plants used by local healers were Artemisia herba alba Asso (UV = 0.85) and Juniperus communis (UV = 0.75). The study highlights the significant number and variety of medicinal plants employed by traditional healers to address digestive disorders. Consequently, this research can aid scientists in identifying plants with medicinal properties that may contribute to the development of new medications.

Keywords: Gastrointestinal disorders, Traditional healers; Oued Souf; Medicinal plants; Indigenous knowledge.

INTRODUCTION

The gastrointestinal tract, a highly sensitive human organ, is susceptible to a diverse range of diseases, including parasites, infectious disorders, gastroenteritis, reflux, bloating, constipation, and diarrhea[1,2] . The prevalence of gastrointestinal illness is notably attributed to infections from various bacterial strains, causing up to 3 million preschooler deaths annually[3]. There is a growing interest in traditional medical systems, driven by the need for more efficient treatment. The demand for fundamental scientific research on medicinal plants used in indigenous medical systems has consequently increased. Recognizing the importance of traditional medicine, the World Health Organization (WHO) acknowledges it as the totality of knowledge, skills, and practices based on theories, beliefs, and experiences inherent to various[4,5].

In Algeria, phytotherapy is deeply rooted in local culture, with indigenous knowledge accumulated over decades through practical study. The diverse flora, fostered by Algeria's geographic position and varied climate, has been extensively used to address numerous maladies, especially digestive system problems[6,7]. Despite lifestyle changes and industrialization, local communities in Algeria's Sahara, one of the world's largest deserts, still rely on traditional healers for medical needs[8]. Recognizing the declining transmission of this tradition, it has become crucial to record the historical applications of therapeutic herbs[6].

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Ethnopharmacological studies play a vital role in acquiring and safeguarding ancestral medicinal history. Scientific investigations are necessary to confirm the efficacy claimed by conventional healers and to identify bioactive substances[9,10]. While numerous ethnobotanical studies globally explore traditional remedies for gastrointestinal disorders[11-14], limited details are known about the traditional usage of therapeutic herbs in the Oued Souf region (North Southeast Algeria) for treating digestive system diseases.

This study aims to document and analyze local knowledge of medicinal plants used by traditional healers to treat gastrointestinal disorders in the Oued Souf region. Specific details include the species employed in treatment, the types of gastrointestinal conditions addressed by certain plants, and the parts of the plant used as medication. Ethnomedical indices are utilized to determine the most preferred plants in the study area, with the data serving as a basis for additional phytochemical and pharmacological research.

MATERIAL AND METHODS

Study area

The Oued Souf region is located in the north-southeast part of Algeria, covering a total area of more than 54,573 km² with a population of 504,401 inhabitants. Geographically, it is situated between latitudes 34° 17' 25" north and 7° 42' 41" east. The research location is bordered to the north by the wilayas of Biskra, Khenchela, and Tébessa, to the east by the Tunisian border, to the west by the wilaya of Djelfa, and to the south by the wilaya of Ouargla. The region comprises three distinct zones, including a sandy region that spans the entire Souf area, as well as the eastern and southern parts of Oued-Righ. This area is part of the great eastern erg and has limited agricultural significance (Figure 1)[15].

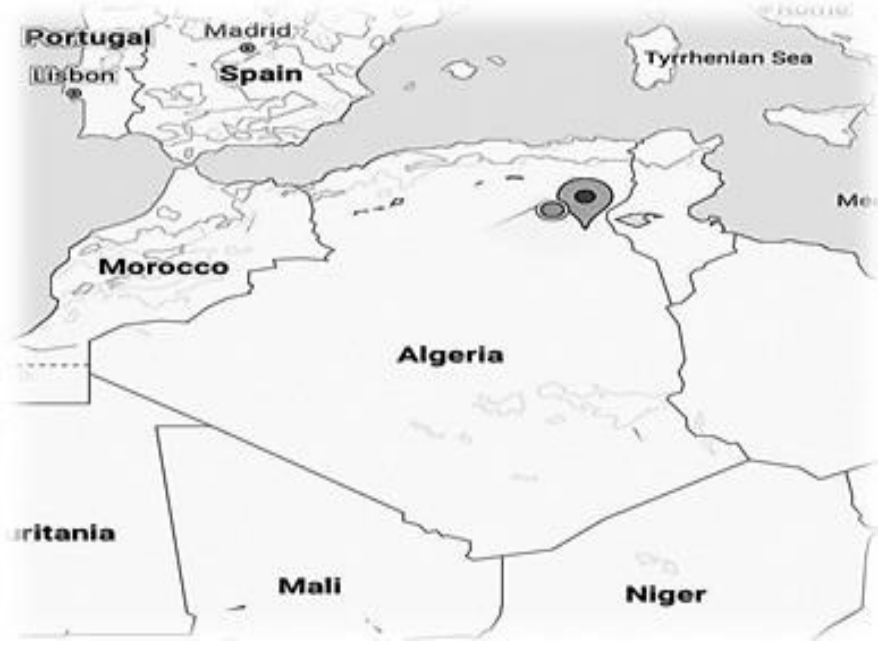

Figure 1. Location of study area (Oued Souf, southeast of Algeria)

Data Collection

This study was conducted from May to September 2022, during which we carried out 20 interviews with traditional healers in the research region, obtaining their permission for participation. To identify medicinal plants used in the treatment of gastrointestinal disorders, we employed semi-structured questionnaires with open-ended questions. The questionnaire, divided into two parts, gathered socio-demographic information (address, age, sex, education level, and years of experience) and details about medicinal plants used for various digestive tract diseases (local name, scientific name, part used, mode of preparation, therapeutic uses, and usage warnings).

Vegetable Resources

During the collection of plant specimens, we sought validation from multiple specialists to ensure result accuracy. The identification of plant samples was confirmed by Professor Youcef Helis from the Scientific and Technical Research Center on Arid Regions C.R.S.T.R.A, Campus of Mohamed Khider University. The scientific and popular names of the medicinal plants were verified using the web database (www.theplantlist.org) and botanical sources on Algerian flora[16,17]. Herbarium specimens of the identified plants were created and stored in the laboratory of Biodiversity and Application of Biotechnology in the Agricultural Field, Faculty of the Sciences of Nature and Life, University of El Oued, Algeria.

Data analysis

The obtained information was statistically examined using metrics such as Use Value (UV) and Informant Consensus Factor (ICF).

Use value (UV)

According to Phillips, Gentry, Reynel, Wilkin, and Gálvez-Durand B[18], UV assessed the relative relevance of a species compared to others and is calculated as: **UV = ΣU/N**, where ***U*** is the number of reports of uses for a certain species, and ***N*** is the total number of informants. A high UV value implies significance, while a low UV value suggests lesser importance than other species[19].

Informant consensus factor (ICF)

ICF measures the degree of knowledge homogeneity among informants. The range is 0 to 1, calculated as: **ICF = (Nur - Nt) / (Nur - 1)**, where ***Nur*** is the number of citations used in each disease category, and ***Nt*** is the number of species used[20].

RESULTS

Demographics data of the responders

In terms of age distribution, the majority of research participants fell within the 41 to 60 age range (50%). Among the total traditional healers, fifteen percent were male, and eighty-five percent were female. The informants exhibited diverse educational backgrounds, ranging from 15% being illiterate to 85% being literate. The results indicate varying levels of expertise among traditional healers, with 45% having the highest proficiency (Table 1).

Table 1. Demographics of survey respondents on medicinal plants used in the treatment of gastrointestinal disorders in Oued Souf region, algeria.

Variable	Categories	Percentage
Sex	Male	85%
	female	15%
Age(years)	<20	0%
	20-40	35%
	41-60	50%
	>60	15%
Educational level	illiterate	15%
	primary level	10%
	middle level	10%
	secondary level	40%
	University level	25%
Experience (years)	10-20	40%
	21-40	45%
	41-60	15%

Utilization of medicinal plants by traditional healers for the treatment of gastrointestinal disorders

Traditional healers in the Oued Souf region utilize 47 species of medicinal plants from 22 botanical families to treat gastrointestinal disorders, as detailed in Table 2. Three plant families are notably significant: Lamiaceae with 9 species, Asteraceae with 7 species, and Apiaceae with 6 species, as illustrated in Figure 2.

Table 2. List of medicinal plants used by traditional healers to treat gastrointestinal disorders in Oued Souf region (north-southeast of Algeria).

N°	Family	Local name	Scientific name	Growth form	Part used	Mode of preparation	Indication	Usage warnings	UV
1	Lamiaceae	Iklil jabel	*Rosmarinus officinalis* L.	Spontaneous	Leaves	Decoction	Gastrointestinal gases	-Is not advised for women who are pregnant or nursing - Causes blood pressure disorders	0.5
		khozama	*Lavandula angustifolia* Mill.	Cultivated	Fruits	Infusion	-Gastrointestinal gases -Gastric disorders	-Leads to male breast development	0.1
		khyata	*Teucrium polium* L.	Spontaneous	All plant	Decoction, Powder	-Gastric ulcer -Diarrhea	-Is not advised for women who are pregnant or nursing -Causes liver disorders	0.2
		Rihan	*Ocimum basilicum* L.	Spontaneous	Leaves	Decoction	-Gastrointestinal gases -Gastric disorders	-Increased bleeding -Causes liver disorders	0.55
		Zaater	*Thymus vulgaris* L.	Spontaneous	All plant	Infusion	-Gastrointestinal gases - Diarrhea	-Is not advised for women who are pregnant or nursing	0.25
		Mardakoch	*Origan marjolaine* L.	Spontaneous	Leaves	Decoction	-Gastric ulcer -Abdominal pain	-Is not advised for: children, women who are pregnant or nursing	0.05
		Maryot	*Marrubium vulgare* L.	Spontaneous	leaves	Infusion	-Indigestion -Gastrointestinal gases	-Is not advised for: women who are pregnant or nursing, children	0.1
		Miramia	*Salvia officinalis* L.	Spontaneous	Stems, Leaves	Infusion	- Diarrhea -Abdominal pain	-Is not advised for: diabetics, women who are pregnant or nursing -Causes liver disorders	0.1

N°	Family	Local name	Scientific name	Growth form	Part used	Mode of preparation	Indication	Usage warnings	UV
		Naanaa	*Mentha crispata* L.	Cultivated	Leaves	Infusion	-Gastrointestinal gases	-Is not advised for diabetics, women who are pregnant or nursing, children	0.25
2	Asteraceae	Babonj	*Matricaria chamomilla* L.	Cultivated	Flowers	Infusion	-Gastric disorders| -Abdominal pain	- It is not permitted for surgical patients	0.3
		Chih	*Artemisia herba alba Asso*	Spontaneous	Leaves	Infusion	-Indigestion -Gastrointestinal gases -Irritable bowel syndrome	-Induces sleeplessness -leads to vomiting	0.85
		Keset hindi	*Saussurea costus* L.	Spontaneous	Roots	Infusion, powder	-Gastric ulcer	-Causes blood pressure disorders -Is not advised for women who are pregnant or nursing	0.05
		Kartofa	*Anacyclus valentinu* L.	Spontaneous	Seeds	Infusion	- Diarrhea -Irritable bowel syndrome -Gastric ulcer	-Is not advised for women who are pregnant or nursing	0.2
		Hindba	*Cichorium intybus* L.	Spontaneous	Roots, Leaves, Flowers	Infusion	-Constipation -Abdominal pain -Gastrointestinal gases	-leads to gallbladder problems -It is not permitted for surgical patients	0.05
		Meraret henech	*Entyraea centarium* L.	Spontaneous	All plant	Decoction, Powder	-Gastrointestinal gases -Hemorrhoids	-Is not advised for women who are pregnant or nursing, children -Causes gastric ulcers	0.1
		Dgeft	*Artemisia campestris* Scop.ex Steud	Cultivated	Leaves	Infusion	- Diarrhea -Abdominal pain	-Is not advised for women who are pregnant or nursing -Causes gastric ulcers	0.25
3	Apiaceae	Heltit	*Ferula assa –foetida* L.	Spontaneous	All plant	Decoction	-Gastric ulcer -Gastrointestinal gases -Irritable bowel syndrome	-Causes blood pressure disorders	0.05

N°	Family	Local name	Scientific name	Growth form	Part used	Mode of preparation	Indication	Usage warnings	UV
		Deriga	*Ammodaucus leucotrichus* Coss. & Durieu	Spontaneous	Seeds	Infusion, decoction	-Irritable bowel syndrome -Abdominal pain gastrointestinal gases -Constipation	- The dosage must be followed	0.15
		Krefs	*Apium graveolens* L.	Cultivated	Seeds	Infusion	-Gastric ulcer -Abdominal pain -Constipation	-Causes blood pressure disorders	0.1
		Kesber	*Coriandrum sativum* L.	Cultivated	Leaves, Seeds	Infusion	-Gastrointestinal gases	-Is not advised for Diabetics, women who are pregnant or nursing -Causes blood pressure disorders	0.1
		Kemun	*Cuminum cyminum* L.	Cultivated	Seeds	Decoction	-Gastrointestinal gases -Irritable bowel syndrome - Diarrhea	-Causes gastric ulcers -Is not advised for women who are pregnant or nursing	0.65
		Yenson	*Pimpinella anisum* L.	Spontaneous	Seeds	Infusion	-Gastric ulcer -Constipation	-Is not advised for Diabetics	0.45
4	Fabaceae	Helba	*Trigonella foenum-graecum* L.	Cultivated	Seeds	Decoction	-Gastric disorders -Constipation	-Is not advised for women who are pregnant or nursing,children	0.45
		Erek sos	*Glycyrrhiza glabra* L.	Spontaneous	Roots	Decoction, Powder	-Chronic inflammatory disorders -Gastric ulcer	-Causes blood pressure disorders -Is not advised for women who are pregnant or nursing	0.15
		Sena meki	*Senna alexandrina* Mill.	Spontaneous	Leaves	Infusion, decoction	-Constipation	-Causes severe diarrhea	0.5
5	Cupressaceae	Debegh	*Thuja occidentalis* L.	Spontaneous	All plant	Infusion	-Chronic inflammatory disorders	-Causes severe diarrhea	0.35
		Araar	*Juniperus communis* L.	Spontaneous	Leaves	Infusion	- Diarrhea -Gastrointestinal gases	-Leads to renal disorders -Causes blood pressure disorders -Is not advised for Diabetics	0.75

N°	Family	Local name	Scientific name	Growth form	Part used	Mode of preparation	Indication	Usage warnings	UV
6	Lauraceae	Rend	*Laurus nobilis* L.	Spontaneous	Leaves	Infusion	-Abdominal pain - Diarrhea -Gastrointestinal gases	-Causes blood pressure disorders -Is not advised for women who are pregnant or nursing	0.15
		Kerfa	*Cinnamomum verum* J.Presl	Cultivated	Stems	Decoctio	-Gastrointestinal gases - Diarrhea	-Increased bleeding -Causes liver disorders -Is not advised for women who are pregnant or nursing	0.05
7	Zingiberaceae	Zenjabil	*Zingiber officinale* Roscoe	Cultivated	Roots	Decoction	-Irritable bowel syndrome -gastric ulcer	-Not take it on an empty stomach	0.25
		Kerkum	*Curcuma longa* L.	Cultivated	Stems	Infision	-Chronic inflammatory disorders	-Increased bleeding -Causes blood pressure disorders -Is not advised for Diabetics	0.1
8	Chenopodiaceae	Ktef	*Atriplex halimus* L.	Spontaneous	Leaves, Seeds	decoction, Powder	-Constipation	-Causes gastric ulcers	0.05
		Demran	*Traganum nudatum* Delile	Spontaneous	All plant	Infusion, decoction	- Diarrhea -Hemorrhoids -Gastrointestinal gases	- The dosage must be followed	0.15
9	Phyllanthaceae	Amlej	*Phyllanthus emblica* L.	Spontaneous	Seeds	Infusion	-Constipation -Gastric ulcer	-Is not advised for women who are pregnant or nursing,Diabetics	0.05
10	Crassulaceae	Serra	*Centella asiatica*.L.	Spontaneous	Roots	Infusion	-Chronic inflammatory disorders	- The dosage must be followed	0.1
11	Amaryllidaceae	Besbess	*Foeniculum vulgare* Mill.	Spontaneous	Seeds	Infusion	-Constipation -Gastrointestinal gases	-Is not advised for women who are pregnant or nursing -Increased bleeding	0.7
12	Lythraceae	Henna	*Lowsonia inermis* L.	Cultivated	leaves , Flowers	Decoction	- Diarrhea	-Is not advised for women who are pregnant or nursing	0.2
13	Theaceae	Chee	*Camellia sinensis* L.	Cultivated	Leaves	Decoction	-Chronic inflammatory disorders	-Causes gastric ulcers -Induces sleeplessness	0.1

N°	Family	Local name	Scientific name	Growth form	Part used	Mode of preparation	Indication	Usage warnings	UV
14	Pinaceae	Senober	*Pinus gerardiana* Wall. Ex D.Don	Spontaneous	Stems	Infusion	-Abdominal pain -Chronic inflammatory disorders -Gastrointestinal gases	- Weight gain	0.1
15	Verbenaceae	Louiza tizana	*Aloysia citrodora* Palau	Cultivated	Leaves	Infusion	-Gastrointestinal gases	-Causes thyroid malfunction	0.15
16	Anacardiaceae	Mestka hora	*Pistacia lentiscus* L.	Cultivated	All plant	Powder	-Gastric ulcer -Chronic inflammatory disorders	-Is not advised for women who are pregnant or nursing, children	0.1
17	Caesalpinioi-deae	kherob	*Ceratonia siliqua* L.	Cultivated	Fruits	Infusion	- Diarrhea -Irritable bowel syndrome	-Is not advised for women who are pregnant or nursing	0.1
18	Apocynaceae	Karenka	*Calotropis procera* A.T.Aiton	Cultivated	leaves, Flowers, Roots	Powder	-Gastric ulcer - Diarrhea	- The dosage must be followed -Is not advised for women who are pregnant or nursing	0.05
19	Rutaceae	Fijel	*Ruta graveolens* L.	Spontaneous	Leaves	Infusion	-Gastrointestinal gases -Abdominal pain -Chronic inflammatory disorders	-Is not advised for women who are pregnant or nursing, children	0.2
20	Rhamnaceae	Sedra	*Ziziphus spina-christi* L.	Spontaneous	Leaves	Infusion	- Gastrointestinal gases - Constipation - Gastric ulcer	-Is not advised for women who are pregnant or nursing, children	0.2
21	Nitrariaceae	Hermel	*Peganum harmala* L.	Spontaneous	Seeds	Infusion	-Abdominal pain	-Is not advised for women who are pregnant or nursing -Causes gastric ulcers	0.15
22	Tamaricaceae	Terfa	*Tamarix aphylla* L.	Spontaneous	All plant	Infusion, decoction	-Constipation	-Is not advised for women who are pregnant or nursing, children	0.1

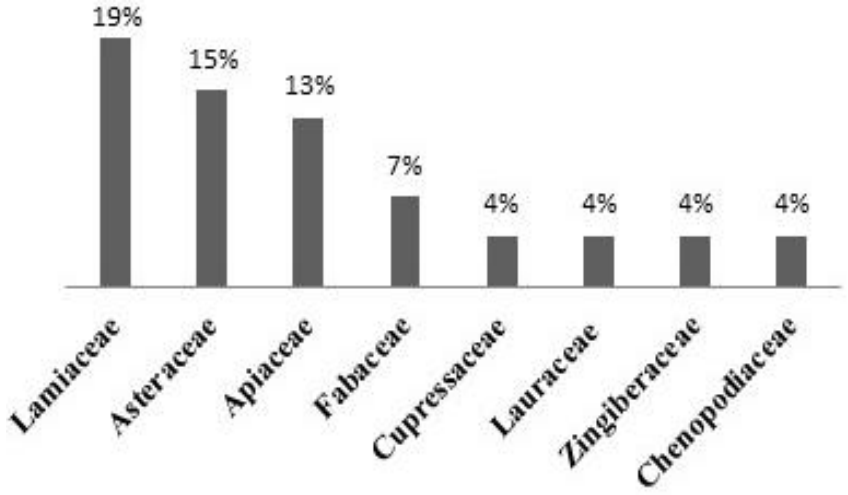

Figure 2. The majority of listed botanical families.

Most frequently utilized species

The most frequently utilized species by traditional healers in the treatment of digestive system disorders include Artemisia herba alba Asso (17 citations), Juniperus communis (15 citations), Foeniculum vulgare (14 citations), Cuminum cyminum (13 citations), Ocimum basilicum (11 citations), Senna alexandrina, and Rosmarinus officinalis (10 citations), as depicted in Figure 3.

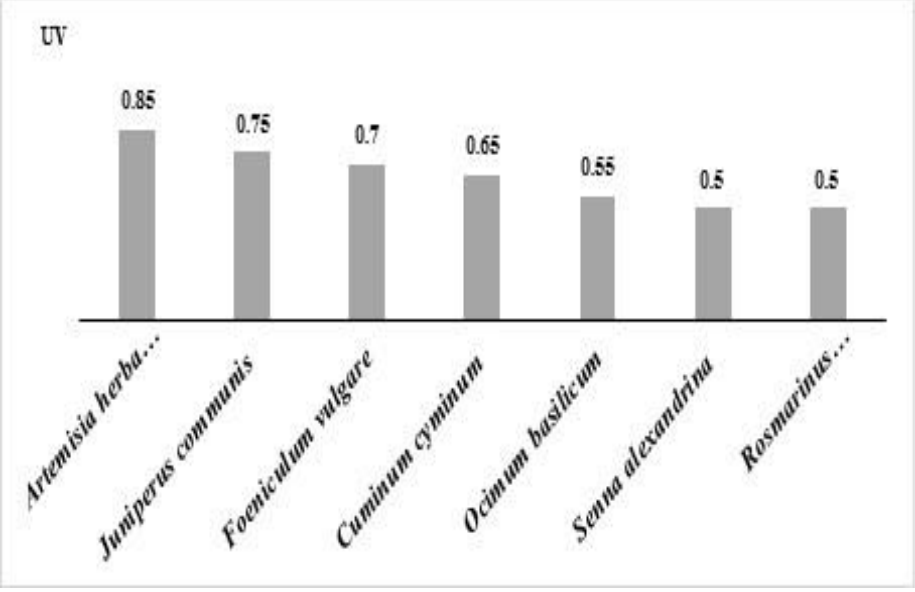

Figure 3. Most frequently utilized species.

Used part

Results indicate that leaves are the most frequently utilized part (35%), followed by seeds (20%), the entire plant (15%), roots (11%), stems (8%), flowers (7%), and fruits (4%) (Figure 4).

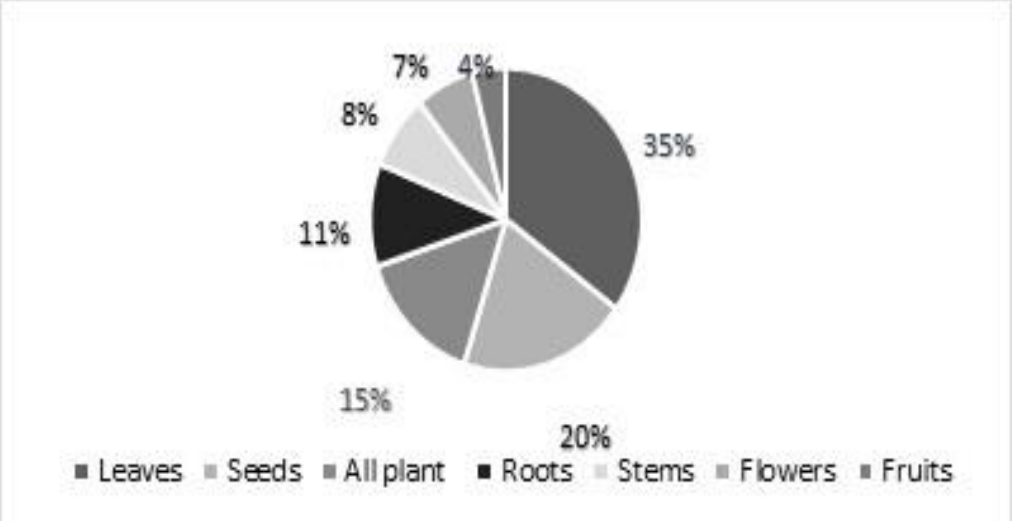

Figure 4. Frequency of plant parts used for treating gastrointestinal disorders.

Method of preparation

The study revealed that the infusion method was the most frequently indicated for preparing herbal remedies (55%), followed by decoction (32%) and powder formulations (13%) (Figure 5).

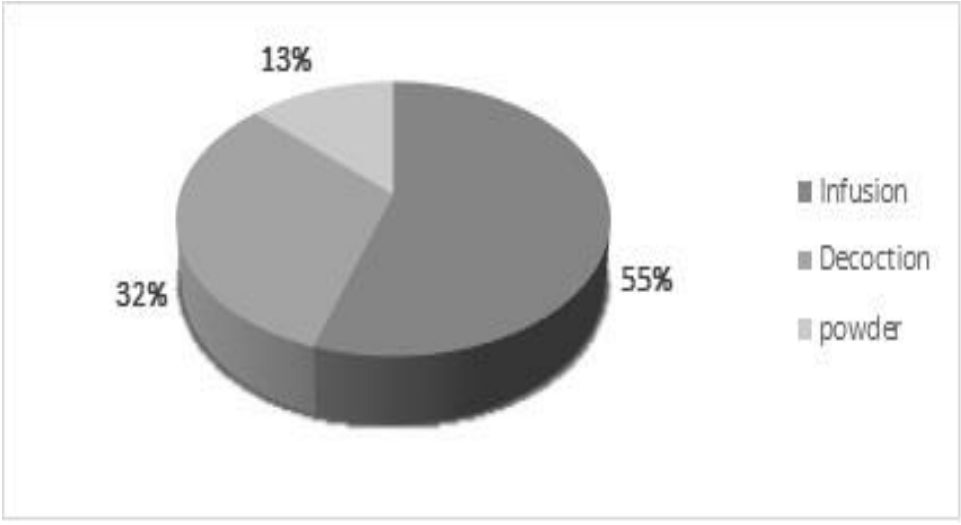

Figure 5. Frequency of several preparation methods for the treatment of gastrointestinal disorders.

Therapeutic uses

Based on the information provided by the respondents, ailments were classified into 10 disorders, with gastrointestinal gases (23%) being the condition most frequently treated with the indicated medicinal plants. This was followed by gastric ulcer and diarrhea (14% each), constipation and abdominal pain (12% each), chronic inflammatory disorders (9%), irritable bowel syndrome (8%), gastric disorders (4%), indigestion, and hemorrhoids (2% each) (Figure 6).

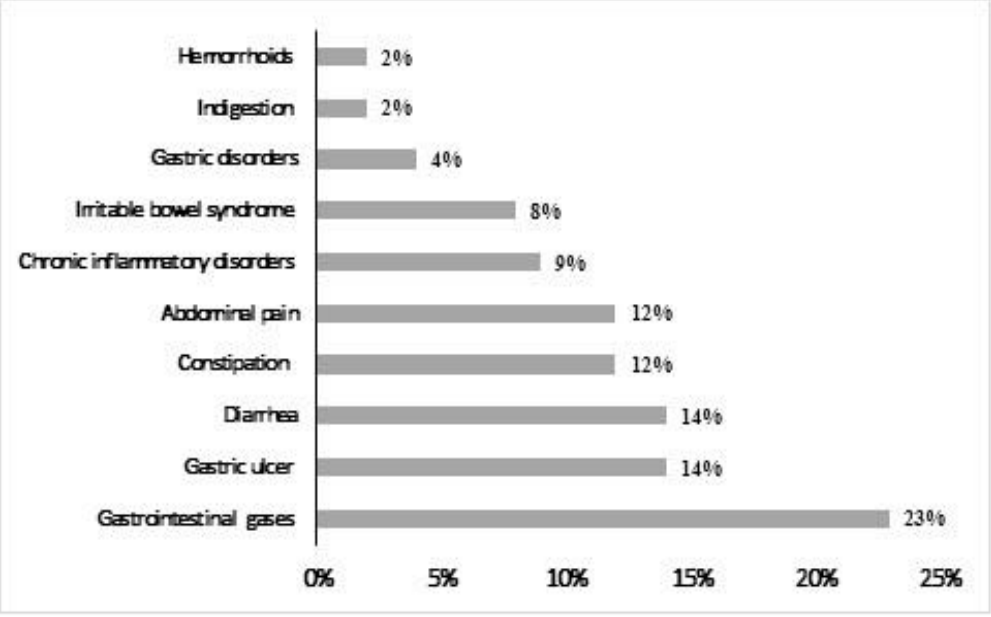

Figure 6. Gastrointestinal disorders treated by medicinal plants in the research area.

Usage warnings

The most crucial warnings provided by traditional healers emphasize that using medicinal herbs to treat digestive ailments is not advised for pregnant or nursing women (33%), children (11%), and individuals with diabetes and blood pressure disorders (9% each). Other cautions include the potential to cause gastric ulcers (7%), liver disorders, increased bleeding, and the importance of following specified dosages (5% each). Additional precautions include avoiding use by surgical patients, as it may cause severe diarrhea and induce sleeplessness (3% each), and it should not be taken on an empty stomach to prevent vomiting, gallbladder problems, male breast development, weight gain, thyroid malfunction, and renal disorders (1% each) (Figure 7).

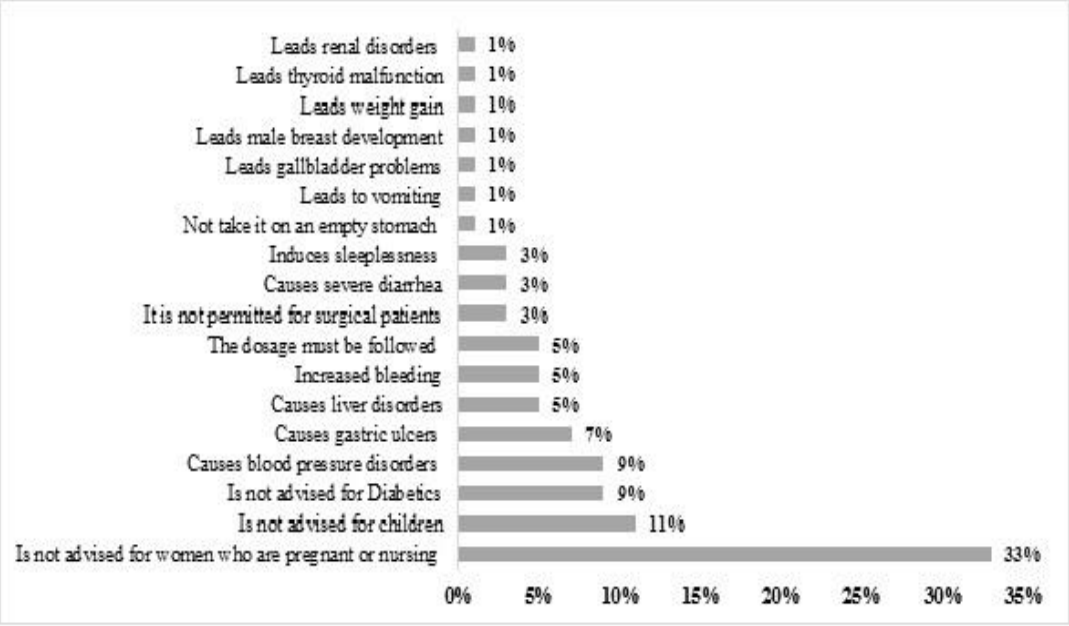

Figure 7. Usage warnings given by traditional healers

Statistical data analysis

Use value UV

The medicinal plants with the highest and lowest usage reports also exhibit the highest and lowest respective use values. In this study, Artemisia herba alba Asso demonstrated the greatest UV value (0.85), while several plants, including Atriplex halimus and Calotropis procera, had the lowest UV value (0.05) (Table 2).

Informant consensus factor (ICF)

The Informant Consensus Factor (ICF) was determined by categorizing all disorders into ten categories in the current study. Hemorrhoids and indigestion showed the highest ICF values (1 each), while gastrointestinal gases had a value of 0.55 (refer to Table 3).

Table 3. Value of informant consensus factor (ICF) for each disease category.

Disease categories	Nur	Nt	ICF
Gastrointestinal gases	21	10	0.55
Gastric disorders	4	3	0.33
Gastric ulcer	13	9	0.33
Diarrhea	13	8	0.41
Abdominal pain	11	7	0.4
Indigestion	2	1	1
Constipation	11	7	0.4
Irritable bowel syndrome	7	5	0.33
Chronic inflammatory disorders	8	5	0.42
Hemorrhoids	2	1	1

DISCUSSION

Though traditional medicine is often associated with a particular gender, it is practiced by both men and women in some cultures. In the current study, a higher number of male respondents were interviewed compared to female respondents. A comparable study by Khoja, Andrabi, and Mir[20] indicated that 34 male healers (70.83%) and 14 female healers (29.17%) were involved. Additionally, research in the M'sila region of Algeria revealed a predominantly male participation in traditional medicine[21]. The sociocultural framework of the society, actual circumstances, informants' commitment, and associated sociocultural boundaries are factors influencing ethnobotanical surveys.

The majority of participants in the present study were aged 41-60 (50%), with the majority of healers (85%) being literate. It appears that the number of reported species is correlated with the informants' ages. Younger individuals, exposed to modern education, may have decreased interest in learning about and applying ethnomedical practices. Simultaneously, as science and technology advance rapidly, younger generations are adopting new customs[22]. Additionally, 45% of healers have between 21 and 40 years of experience. Bouasla and Bouasla6 emphasize that experience gained with age provides older individuals with more knowledge. Furthermore, Kadir, Sayeed, and Mia[23] found that the majority of healers (33.36%) have 10–20 years of relevant expertise from their ethnopharmacological assessment.

This study reports the utilization of 47 medicinal plant species from 22 families by traditional healers for treating gastrointestinal disorders in the Oued Souf region. Lamiaceae, with 9 species, emerges as the most utilized plant, followed by Asteraceae (7 species), Apiaceae (6 species), and Fabaceae (3 species). These findings contrast with those of Kadir, Sayeed, and Mia[23], who claimed that the Fabaceae family accounted for the majority of medicinal plants used by traditional healers in Bangladesh. This discrepancy highlights the considerable taxonomic diversity of medicinal plants in our study area, underscoring the wealth of knowledge regarding their application in traditional gastrointestinal treatment[24]. Furthermore, Lamiaceae is notable for its high content of phenolics and flavonoids, contributing to its elevated antioxidant levels, as demonstrated in previous research[25].

The most cited species in our study are *Artemisia herba alba Asso* and *Juniperus communis* (17-15 citations). The widespread usage of these species by respondents for various ailments can be attributed to their familiarity and frequent employment. However, it is crucial to note that intensive usage and overuse of these species may jeopardize their survival, impacting the region's biodiversity[6].

Results indicate that leaves are the most frequently utilized plant part (35%). This aligns with several investigations emphasizing the significance of leaves in developing remedies, as highlighted by Abdulsalami, Mudi, Daudu, Aliyu, Adabara, and Hamzah[22]. The effectiveness of leaves in treating illnesses may be attributed to the various bioactive components they contain, as leaves actively participate in photosynthesis, making them a crucial component of several herbal remedies[26].

The study revealed that the infusion method was most commonly indicated (55%). Traditional healers believe that infusion is the most effective method for preparing medicinal extracts to treat gastrointestinal diseases because it maintains the therapeutic characteristics of the extract, allowing for the secure extraction of active ingredients[27]. The simplicity of preparation and administration makes decoction and infusion in water popular techniques, as highlighted in previous research[28,29].

Gastrointestinal gases (23%) represent the most frequently treated condition with the indicated medicinal plants. Several plants have demonstrated robust biological defenses against a range of digestive illnesses. Consequently, delving into the biological research of some medicinal plants used by Oued Souf healers to treat

gastrointestinal disorders becomes particularly intriguing.

Traditional healers emphasize a crucial piece of advice by prohibiting the use of medicinal herbs for pregnant women (33%). It is erroneous and deceptive to assume that herbal treatments are exceptionally safe and devoid of side effects, as is commonly believed. Herbs have been shown to induce various unpleasant or unfavorable responses, some of which have the potential to be lethal or cause severe injuries and other life-threatening conditions. It is crucial to remember that larger dosages of therapeutic plants can occasionally have detrimental consequences[30].

In the current study, Artemisia herba-alba Asso and Juniperus communis have the highest UV value (0.85) due to their diverse therapeutic characteristics. Conversely, low usage values (UV) for medicinal plants suggest that access to or knowledge of those particular plants may be at risk[31,32]. Hemorrhoids and indigestion each have the highest ICF values (1). A high ICF score (1.0 or near 1) indicates the usage of a relatively small number of plant species by a significant majority of informants[33].

Most frequently, plants such as Foeniculum vulgare, Cuminum cyminum, Coriandrum sativum, Ammodaucus leucotrichus, Rosmarinus officinalis, Ocimum basilicum, Mentha crispata, Entyraea centarium, Aloysia citrodora, Ruta graveolens, and Traganum nudatum were claimed to be helpful for treating gastrointestinal gas. The informants' consensus on using a specific plant species to treat various ailments is reflected in the high ICF value. This suggests that these plants may contain physiologically active components[34]. Foeniculum vulgare (Apiaceae) is a well-known plant with significant therapeutic value, particularly for treating gastrointestinal disorders[35]. Cumin seeds are believed to have carminative properties, and according to tradition, the plant may be effective in treating a variety of conditions, including diarrhea, jaundice, dyspepsia, indigestion, and stomach discomfort[36,37].

CONCLUSION

The aim of the present study was to identify potential medicinal plants in the Oued Souf region (North Southeast Algeria) that traditional healers may use to treat various gastrointestinal disorders.

Our survey yielded a wealth of data, clearly demonstrating that traditional healers in the Oued Souf region employ numerous medicinal plants for treating various digestive system ailments. A total of 47 medicinal plant species from 22 families were documented in this research, with Lamiaceae and Asteraceae being the most common families. Plant leaves were predominantly used to address GI-related problems, and infusion emerged as the most widely employed conventional preparation technique in the area. It is crucial to document the preservation of traditional knowledge before it diminishes from the region, where it is disappearing at an alarming rate. While preliminary research on these medicinal plants has shown their effectiveness, further investigation is necessary, particularly to ensure the safe use of these plants in therapeutic procedures.

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REFERENCES

1. Kasper, D. and Harrison, T. R. *Harrison's principles of internal medicine.* Vol. 1; McGraw-Hill, Medical Publishing Division. 2005.
2. Mir, T. A., Khare, R. K., and Jan, M. Medicinal plants used against gastrointestinal complaints in district Budgam of Jammu and Kashmir-An ethnomedicinal study. *Ethnobot Res.App*. 2021; 22:1-16.
3. Farthing, M. J., and Kelly, P. Infectious diarrhoea. *Medicine (Baltimore).* 2007; 35:251-256.
4. Lafi, Z., Aboalhaija, N., and Afifi, F. Ethnopharmacological importance of local flora in the traditional medicine of Jordan: (A mini review). *Jordan Journal of Pharmaceutical Sciences*. 2022; 15:132-144.
5. Akerele, O. WHO's traditional medicine programme: progress and perspectives. *WHO Chron.* 1984; 38:76-81.
6. Bouasla, A. and Bouasla, I. Ethnobotanical survey of medicinal plants in northeastern of Algeria. *Phytomedicine*. 2017; 36:68-81.
7. Boutlelis, D. A., Sabrina, C., Mounia, B., Salah, B., Ibtissam, L., and Chaima, B. Therapeutic Potential of Traditional Medicinal Plants from Algeria for Treatment of Liver Diseases. *Jordan Journal of Pharmaceutical Sciences*. 2023; 16:529-540.
8. Benarba, B. Medicinal plants used by traditional healers from South-West Algeria: An ethnobotanical study. *J Intercult Ethnopharmacol*. 2016; 5:320.
9. Brahmi, F. Khaled-Khodja, N. Bezeghouche, R. Bouharis, S. Elsebai, M. F. Madani, K. and Boulekbache-Makhlouf, L. Ethnobotanical Study of the Most Lamiaceae Used as Medicinal and Culinary Plants by the Population of Bejaia Province, Algeria. *Jordan Journal of Pharmaceutical Sciences*. 2023; 268-281.
10. Mushagalusa Kasali, F. Ahadi Irenge, C. Murhula Hamuli, P. Birindwa Mulashe, P. Murhula Katabana, D. Mangambu Mokoso, J. D. D. Mpiana, P. T. and Ntokamunda Kadima, J. Ethnopharmacological survey on treatment of hypertension by traditional healers in Bukavu City, DR Congo. *Evid Based Complement Altern Med*. 2021; 1-10.
11. Heinrich, M., Rimpler, H., and Barrera, N. A. Indigenous phytotherapy of gastrointestinal disorders in a lowland Mixe community (Oaxaca, Mexico): Ethnopharmacologic evaluation. *J. Ethnopharmacol.* 1992; 36:63-80.
12. Tetali, P., Waghchaure, C., Daswani, P., Antia, N., and Birdi, T. Ethnobotanical survey of antidiarrhoeal plants of Parinche valley, Pune district, Maharashtra, India. *J. Ethnopharmacol.* 2009; 123:229-236.
13. Vera-Ku, M., Méndez-González, M., Moo-Puc, R., Rosado-Vallado, M., Simá-Polanco, P., Cedillo-Rivera, R., and Peraza-Sánchez, S. R. Medicinal potions used against infectious bowel diseases in Mayan traditional medicine. *J. Ethnopharmacol.* 2010; 132:303-308.
14. Sulaiman, A. N., Arzai, A. H., and Taura, D. W. Ethnobotanical survey: A comprehensive review of medicinal plants used in treatment of gastro intestinal diseases in Kano state, Nigeria. *Phytomedicine Plus*. 2022; 2:100180.
15. Kholladi, M.K. SIG pour le suivi de la remontée des eaux de la wilaya d'El Oued Souf. *Congrès internationale en Informatique appliquée CiiA*. 2005; *5*.
16. Kaddem, S. Les plantes médicinales en Algérie, Ed. *Bouchène, Oued Zenati, Algérie*. 1990.
17. Aissa, F. B. Medicinal plants in Algeria. Identification, description of active ingredient properties and traditional use of common plants in Algeria. 1991.
18. Phillips, O., Gentry, A. H., Reynel, C., Wilkin, P., and Gálvez-Durand B. C. Quantitative ethnobotany and Amazonian conservation. *Conserv Biol*. 1994; 8:225-248.
19. Musa, S. M., Fathelrhman, E. A., Elsheikh, A. E., Lubna, A. A., Abdel, L. E. M., and Sakina, M. Y. Ethnobotanical study of medicinal plants in the Blue Nile State, South-eastern Sudan. *J Med Plant Res*. 2011; 5:4287-4297.
20. Khoja, A. A., Andrabi, S. A. H., and Mir, R. A. Traditional medicine in the treatment of gastrointestinal diseases in northern part of Kashmir Himalayas. *Ethnobot Res.App*. 2022; 23:1-17.

21. Boudjelal, A., Henchiri, C., Sari, M., Sarri, D., Hendel, N., Benkhaled, A., and Ruberto, G. Herbalists and wild medicinal plants in M'Sila (North Algeria): An ethnopharmacology survey. *J. Ethnopharmacol.* 2013; *148*:395-402.
22. Abdulsalami, H., Mudi, S. Y., Daudu, O. A. Y., Aliyu, B. S., Adabara, N. U., and Hamzah, R. U. Ethnobotanical survey of medicinal plants used in the treatment of gastrointestinal tract infections in Ebiraland Kogi state, Nigeria. *J Med Plants Stud*. 2020; 8:38-44.
23. Kadir, M. F., Sayeed, M. S. B., and Mia, M. Ethnopharmacological survey of medicinal plants used by traditional healers in Bangladesh for gastrointestinal disorders. *J. Ethnopharmacol.* 2013; 147:148-156.
24. Chekole, G. Ethnobotanical study of medicinal plants used against human ailments in Gubalafto District, Northern Ethiopia. *J Ethnobiol Ethnomed*. 2017; 13:1-29.
25. Khaled-Khodja, N., Boulekbache-Makhlouf, L., and Madani, K. Phytochemical screening of antioxidant and antibacterial activities of methanolic extracts of some Lamiaceae. *Ind Crops Prod*. 2014; 61:41-48.
26. Shosan, L., Fawibe, O., Ajiboye, A., Abeegunrin, T., and Agboola, D. Ethnobotanical survey of medicinal plants used in curing some diseases in infants in Abeokuta South Local Government Area of Ogun State, Nigeria. *Amer J Pl Sci*. 2014; 5:3258.
27. Dextreit, R. *La cure vegetale: Toutes les plantes pour se guerir*; Editions de la Revue" Vivre en harmonie". 1987.
28. Hammiche, V. and Maiza, K. Traditional medicine in Central Sahara: pharmacopoeia of Tassili N'ajjer. *J. Ethnopharmacol.* 2006; 105:358-367.
29. Benítez, G., González-Tejero, M., and Molero-Mesa, J. Pharmaceutical ethnobotany in the western part of Granada province (southern Spain): Ethnopharmacological synthesis. *J. Ethnopharmacol.* 2010; 129: 87-105.
30. Ekor, M. The growing use of herbal medicines: issues relating to adverse reactions and challenges in monitoring safety. *Front Pharmacol*. 2014; 4: 177.
31. Chaudhary, M. I., He, Q., Cheng, Y., and Xiao, P. Ethnobotany of medicinal plants from tian mu Shan biosphere reserve, Zhejiang-province, China. *Asian J Plant Sci*. 2006.
32. Mahmood, A., Mahmood, A., Malik, R. N., and Shinwari, Z. K. Indigenous knowledge of medicinal plants from Gujranwala district, Pakistan. *J. Ethnopharmacol.* 2013; 148: 714-723.
33. Heinrich, M., Ankli, A., Frei, B. Weimann, C., and Sticher, O. Medicinal plants in Mexico: Healers' consensus and cultural importance. *Soc. Sci. Med.* 1998; 47:1859-1871.
34. Cakilcioglu, U. and Turkoglu, I. An ethnobotanical survey of medicinal plants in Sivrice (Elazığ-Turkey). *J. Ethnopharmacol.* 2010; 132:165-175.
35. Verma, R., Tyagi, C., and Budholiya, P. Evaluate bioactive constituents and anti-pyretic potential of hydroalcoholic extracts of Foeniculum vulgare. *Int J Pharm Drug Res*. 2021; 9:41-50.
36. Tahir, H. U., Sarfraz, R. A., Ashraf, A., and Adil, S. Chemical composition and antidiabetic activity of essential oils obtained from two spices (Syzygium aromaticum and Cuminum cyminum). *Int J Food Prop*. 2016; 19:2156-2164.
37. Singh, N., Yadav, S. S., Kumar, S., and Narashiman, B. A review on traditional uses, phytochemistry, pharmacology, and clinical research of dietary spice Cuminum cyminum L. *Phytother. Res.* 2021; 35:5007-5030.

النباتات الطبية المستخدمة من طرف المعالجين التقليديين في علاج اضطرابات الجهاز الهضمي في منطقة واد سوف (جنوب شرق الجزائر)

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ملخص

هدفت هذه الدراسة إلى توثيق وتحليل المعرفة الأصلية للنباتات الطبية التي يستخدمها المعالجون التقليديون لعلاج اضطرابات الجهاز الهضمي في منطقة وادي سوف (شمال الشرق الجزائري)، تم إجراء الاستطلاع من مايو إلى سبتمبر 2022، وفيه استجوب 20 معالجًا تقليديًا باستخدام أسئلة مفتوحة واستبيان شبه منظم. يتضمن النموذج المعلومات الاجتماعية والديموغرافية للمعالج والأسماء المحلية والعلمية للنبات الطبي، الأجزاء المستخدمة منه وطرق تحضيره، تحذيرات الاستخدام. لتقييم البيانات التي تم جمعها، تمت دراسة عاملين هما Usage Value و Informant Consensus Factor. أظهرت النتائج التي توصلنا إليها أن المعالجين التقليديين في منطقة واد سوف يستخدمون 47 نوعًا من النباتات الطبية من 22 عائلة لعلاج اضطرابات الجهاز الهضمي. كما كشفت نتائج التحقيق أن العمر والجنس والمستوى التعليمي وسنوات الخبرة جميعها لها تأثير على مدى تكرار استخدام النباتات الطبية. تعتبر كل من Lamiaceae، Asteraceae، أكثر العائلات استعمالا بمعدل 9 و 7 أنواع على التوالي. كانت الأجزاء النباتية الأكثر استخدامًا هي الأوراق (35٪)، والغليان هي الطريقة الأفضل في تحضير المستخلص العشبي (55٪). بالإضافة إلى ذلك، كان النبات الأكثر شيوعًا الذي استخدمه المعالجون المحليون هو Asso *Artemisia herba alba* (UV = 0.85). كما تم الاتفاق على أن عسر الهضم والبواسير هي أكثر اضطرابات الجهاز الهضمي التي يتم علاجها (FIC =1 لكل منهما). ومنه فان المعالجين التقليديين في منطقة وادي سوف على دراية تامة بالنباتات الطبية واستخداماتها. ويمكن للباحثين والعلماء العثور على نباتات ذات صفات طبية قد تكون مفيدة في ابتكار أدوية جديدة باستخدام هذا المسح العرقي النباتي.

الكلمات الدالة: اضطرابات الجهاز الهضمي، المعالجون التقليديون، وادي سوف، النباتات الطبية، المعرفة التقليدية، الجزائر.

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